

**THAT WHICH IS CLAIMED IS:**

1. A process for producing a dilute ethylene stream and a dilute propylene stream from a cracked gas stream, said process comprising the following steps in the order named:

(1) separating said cracked gas stream in a deethanizer zone to produce a C<sub>2</sub> – stream

5 and a C<sub>3</sub>+ stream;

(2). hydrogenating said C<sub>2</sub>- stream in a hydrogenation zone to remove a portion of the acetylene to produce said dilute ethylene stream;

(3) separating said C<sub>3</sub>+ stream in a depropanizer zone to produce a C<sub>3</sub>- stream and a C<sub>4</sub>+ stream; and

10 (4) reacting said C<sub>3</sub>- stream in a MAPD reactor zone to convert a portion of methylacetylene and propadiene to propylene and propane to produce said dilute propylene stream.

2. A process according to claim 1 further comprising separating said C<sub>4</sub>+ stream in a debutanizer zone to produce a C<sub>4</sub> stream and a C<sub>5</sub>+ stream.

15 3. A process according to claim 1 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

4. A process according to claim 4 wherein said dilute ethylene derivative unit produces ethylbenzene.

5. A process according to claim 1 further comprising passing said dilute propylene stream  
20 to a dilute propylene derivative unit.

6. A process according to claim 5 wherein said dilute propylene derivative unit produces cumene, acrylic acid or propylene oxide.

7 A process according to claim 2 further comprising treating said C<sub>5</sub>+ stream in a hydrotreating zone to produce a C<sub>5</sub> diolefins stream, a BTX stream, a DCPD stream and a fuel oil stream.

8. A process according to claim 1 wherein said cracked gas stream is produced by a process

5 comprising:

(1) heating a hydrocarbon feed in a cracking zone to form a raw cracked gas stream; wherein said raw cracked gas stream comprises hydrogen, methane, C<sub>2</sub> hydrocarbons, C<sub>3</sub> hydrocarbons and heavier constituents;

(2) quenching said raw cracked gas stream in a quenching zone to produce a  
10 quenched, cracked gas stream;

(3) compressing said quenched, cracked gas stream in a first compression zone to form a pressurized, cracked gas stream;

(4) deacidifying said pressurized, cracked gas stream in a deacidifying zone to remove a portion of the hydrogen sulfide to form a wet cracked gas stream; and

(5) drying said wet cracked gas stream in a drying zone to form a cracked gas  
15 stream.

9. A process according to claim 8 wherein said hydrocarbon feed is selected from the group consisting of ethane, propane, butanes, pentanes, naphtha, and mixtures thereof.

10. A process according to claim 8 wherein said hydrocarbon feed consists essentially of C<sub>5</sub>  
20 hydrocarbons.

11. A process for producing a dilute ethylene stream and a dilute propylene stream from a cracked gas stream, said process comprising the following steps in the order named:

(1) separating said cracked gas stream in a deethanizer zone to produce a C<sub>2</sub> – stream and a C<sub>3</sub>+ stream;

(2) compressing said  $C_2^-$  stream in a compression zone to form a pressurized  $C_2^-$  stream;

(3) hydrogenating said pressurized  $C_2^-$  stream in a hydrogenation zone to remove a portion of the acetylene to produce said dilute ethylene stream;

5 (4) separating said  $C_3^+$  stream in a depropanizer zone to produce a  $C_3^-$  stream and a  $C_4^+$  stream; and

(5) reacting said  $C_3^-$  stream in a MAPD reactor zone to convert a portion of methylacetylene and propadiene to propylene and propane to produce said dilute propylene stream.

10 12. A process according to claim 11 further comprising separating said  $C_4^+$  stream in a debutanizer zone to produce a  $C_4$  stream and a  $C_5^+$  stream.

13. A process according to claim 11 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

14. A process according to claim 13 wherein said dilute ethylene derivative unit produces  
15 ethylbenzene.

15. A process according to claim 11 further comprising passing said dilute propylene stream to a dilute propylene derivative unit.

16. A process according to claim 15 wherein said dilute propylene derivative unit produces  
20 cumene, acrylic acid, or propylene oxide.

17. A process according to claim 12 further comprising treating  $C_5^+$  stream in a hydrotreating zone to produce a  $C_5$  diolefins stream, a BTX stream, a DCPD stream, and a fuel oil stream.

18. A process according to claim 11 wherein said cracked gas stream is produced by a  
25 process comprising:

(1) heating a hydrocarbon feed in a cracking zone to form a raw cracked gas stream; wherein said raw cracked gas stream comprises hydrogen, methane,  $C_2$  hydrocarbons,  $C_3$  hydrocarbons, and heavier constituents;

(2) quenching said raw cracked gas stream in a quenching zone to produce a  
5 quenched, cracked gas stream;

(3) compressing said quenched, cracked gas stream in a first compression zone to form a pressurized cracked gas stream;

(4) deacidifying said pressurized, cracked gas stream in a deacidifying zone to remove a portion of the hydrogen sulfide to form a wet cracked gas stream; and

10 (5) drying said cracked gas stream in a drying zone to produce a cracked gas stream.

19. A process according to claim 18 wherein said hydrocarbon feed is selected from the group consisting of ethane, propane, butanes, pentanes, naphtha, and mixtures thereof.

20. A process according to claim 18 wherein said hydrocarbon feed consists essentially of  $C_5$  hydrocarbons.

15 21. A process for producing a dilute ethylene stream and a dilute propylene stream from a cracked gas stream, said process comprising the following steps in the order named:

(1) hydrogenating a portion of the acetylene in said cracked gas stream in a hydrogenation zone to produce a reduced acetylene cracked gas stream;

(2) separating said reduced acetylene cracked gas stream in a deethanizer zone to  
20 produce said dilute ethylene stream and a  $C_3+$  stream;

(3) separating said  $C_3+$  stream in said depropanizer zone to produce a  $C_3-$  stream and a  $C_4+$  stream; and

(4) reacting said  $C_3-$  stream in a MAPD reactor zone to convert a portion of methylacetylene and propadiene to propylene and propane to produce the dilute propylene  
25 stream.

22. A process according to claim 21 further comprising separating said C<sub>4</sub>+ stream in a debutanizer zone to produce a C<sub>4</sub> stream and a C<sub>5</sub>+ stream.

23. A process according to claim 21 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

5 24. A process according to claim 21 wherein said dilute ethylene derivative unit produces ethylbenzene.

25. A process according to claim 21 further comprising passing said dilute propylene stream to a dilute propylene derivative unit.

10 26. A process according to claim 25 wherein said dilute propylene derivative unit produces cumene, acrylic acid, or propylene oxide.

27. A process according to claim 22 further comprising treating C<sub>5</sub>+ stream in a hydrotreating zone to produce a C<sub>5</sub> diolefins stream, a BTX stream, a DCPD stream, and a fuel oil stream.

15 28. A process according to claim 21 wherein said cracked gas stream is produced by a process comprising:

(1) heating a hydrocarbon feed in a cracking zone to form a raw cracked gas stream; wherein said raw cracked gas stream comprises hydrogen, methane, C<sub>2</sub> hydrocarbons, C<sub>3</sub> hydrocarbons, and heavier constituents;

20 (2) quenching said raw cracked gas stream in a quenching zone to produce a quenched, cracked gas stream;

(3) compressing said quenched, cracked gas stream in a first compression zone to form a pressurized, cracked gas stream;

25 (4) deacidifying said pressurized, cracked gas stream in a deacidifying zone to remove a portion of the hydrogen sulfide to form a wet cracked gas stream; and

(5) drying said cracked stream in a drying zone to produce a cracked gas stream.

29. A process according to claim 25 wherein said hydrocarbon feed is selected from the group consisting of ethane, propane, butanes, pentanes, naphtha and mixtures thereof.

30. A process according to claim 25 wherein said hydrocarbon feed consists essentially of C<sub>5</sub>

5 hydrocarbons.

31. A process for producing a dilute ethylene stream and a dilute propylene stream, said process comprising the following steps in the order named:

(1) heating a hydrocarbon feed in a cracking zone to form a raw cracked gas stream; wherein said cracked gas stream comprises hydrogen, methane, C<sub>2</sub> hydrocarbons, C<sub>3</sub>

10 hydrocarbons and heavier constituents;

(2) quenching said raw cracked gas stream in a quenching zone to produce a quenched, cracked gas stream;

(3) compressing said quenched, cracked gas stream in a first compression zone to form a pressurized cracked gas stream;

15 (4) deacidifying said pressurized, cracked gas stream in a deacidifying zone to remove a portion of the hydrogen sulfide to form a wet cracked gas stream;

(5) drying said wet cracked gas stream in a drying zone to produce a cracked gas stream.

(6) separating said cracked gas stream in a deethanizer zone to produce a C<sub>2</sub>- stream  
20 and a C<sub>3</sub>+ stream;

(7) compressing said C<sub>2</sub>- stream in a second compression zone to form a pressurized C<sub>2</sub>- stream;

(8) hydrogenating said pressurized C<sub>2</sub>- stream in a hydrogenation zone to remove a portion of the acetylene to produce said dilute ethylene stream; and

(9) separating said  $C_3+$  stream in a depropanizer zone to produce said dilute propylene stream and a  $C_4+$  stream.

(10) reacting said  $C_3-$  stream in a MAPD reactor zone to convert a portion of methylacetylene and propadiene to propylene and propane to produce said dilute propylene stream.

32. A process according to claim 31 further comprising separating said  $C_4+$  stream in a debutanizer zone to produce a  $C_4$  stream and a  $C_5+$  stream.

33. A process according to claim 32 further comprising treating  $C_5+$  stream in a hydrotreating zone to produce a  $C_5$  diolefins stream, a BTX stream, a DCPD stream, and a fuel oil stream.

34. A process according to Claim 31 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

35. A process according to claim 34 wherein said dilute ethylene derivative unit produces ethylbenzene.

36. A process according to claim 31 further comprising passing said dilute propylene stream to a dilute propylene derivative unit.

37. A process according to claim 36 wherein said dilute propylene derivative unit produces cumene, acrylic acid or propylene oxide.

38. A process according to claim 31 wherein said hydrocarbon feed is selected from the group consisting of ethane, propane, butanes, pentanes, naphtha and mixtures thereof.

39. A process according to claim 31 wherein said hydrocarbon feed consists essentially of  $C_5$  hydrocarbons.

40. A process for producing a dilute ethylene stream and a dilute propylene stream, said process comprising the following steps in the order named:

(1) heating a hydrocarbon feed in a cracking zone to form a cracked gas stream;  
wherein said cracked gas stream comprises hydrogen, methane, C<sub>2</sub> hydrocarbons, C<sub>3</sub>  
hydrocarbons, and heavier constituents;

(2) quenching said raw cracked gas stream in a quenching zone to produce a  
5 quenched, cracked gas stream;

(3) compressing said quenched, cracked gas stream in a first compression zone to  
form a pressurized cracked gas stream;

(4) deacidifying said pressurized, cracked gas stream in a deacidifying zone to  
remove a portion of the hydrogen sulfide to form a wet cracked gas stream;

10 (5) drying said wet cracked gas stream in a drying zone to produce a cracked gas  
stream;

(6) separating said cracked gas stream in a deethanizer zone to produce a C<sub>2</sub>- stream  
and a C<sub>3</sub>+ stream;

(7) hydrogenating said pressurized, C<sub>2</sub>- stream in said hydrogenation zone to remove  
15 a portion of the acetylene to produce said dilute ethylene stream; and

(8) separating said C<sub>3</sub>+ stream in a depropanizer zone to produce said dilute  
propylene stream and a C<sub>4</sub>+ stream.

(9) reacting said C<sub>3</sub>- stream in a MAPD zone to convert a portion of  
methylacetylene and propadiene to propylene and propane to produce said dilute propylene  
20 stream.

41. A process according to claim 40 further comprising separating said C<sub>4</sub>+ stream in a  
debutanizer zone to produce a C<sub>4</sub> stream and a C<sub>5</sub>+ stream.

42. A process according to claim 40 further comprising treating C<sub>5</sub>+ stream in a  
hydrotreating zone to produce a C<sub>5</sub> diolefins stream, a BTX stream, a DCPD stream, and a fuel

25 oil stream.



43. A process according to Claim 40 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

44. A process according to Claim 43 wherein said dilute ethylene derivative unit produces ethylbenzene.

5 45. A process according to Claim 40 further comprising passing said dilute propylene stream to a dilute propylene derivative unit.

46. A process according to Claim 45 wherein said dilute propylene derivative unit produces cumene, acrylic acid, or propylene oxide.

47. A process according to claim 40 wherein said hydrocarbon feed is selected from the  
10 group consisting of ethane, propane, ethane-propane mix, butanes, pentanes and naphtha and mixtures thereof.

48. A process according to claim 40 wherein said hydrocarbon feed consists essentially of C<sub>5</sub> hydrocarbons.

49. A process for producing a dilute ethylene stream and a dilute propylene stream from a  
15 cracked gas stream, said process comprising the following steps in the order named:

(1) heating a hydrocarbon feed in a cracking zone to form a raw cracked gas stream;  
wherein said raw cracked gas stream comprises hydrogen, methane, C<sub>2</sub> hydrocarbons, C<sub>3</sub> hydrocarbons, and heavier constituents;

(2) quenching said raw cracked gas stream in a quenching zone to produce a  
20 quenched, cracked gas stream;

(3) compressing said quenched, cracked gas stream in a first compression zone to form a pressurized cracked gas stream;

(4) deacidifying said pressurized, cracked gas stream in a deacidifying zone to remove a portion of the hydrogen sulfide to form a wet cracked gas stream; and

25 (5) drying said cracked gas stream in a drying zone to produce a cracked gas stream.

(6) hydrogenating a portion of the acetylene in said cracked gas stream in a hydrogenation zone to produce a reduced acetylene cracked gas stream;

(7) separating said reduced acetylene cracked gas stream in a deethanizer zone to produce said dilute ethylene stream and a C<sub>3</sub>+ stream;

5 (8) separating said C<sub>3</sub>+ stream in said depropanizer zone to produce a C<sub>3</sub>- stream and a C<sub>4</sub>+ stream; and

(9) reacting said C<sub>3</sub>- stream in a MAPD reactor zone to convert a portion of methylacetylene and propadiene to propylene and propane to produce the dilute propylene stream.

10 50. A process according to claim 49 further comprising separating said C<sub>4</sub>+ stream in a debutanizer zone to produce a C<sub>4</sub> stream and a C<sub>5</sub>+ stream.

51. A process according to claim 49 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

52. A process according to claim 51 wherein said dilute ethylene derivative unit produces  
15 ethylbenzene.

53. A process according to claim 49 further comprising passing said dilute propylene stream to a dilute propylene derivative unit.

54. A process according to claim 53 wherein said dilute propylene derivative unit produces cumene, propylene oxide, or acrylic acid.

20 55. A process according to claim 50 further comprising treating C<sub>5</sub>+ stream in a hydrotreating zone to produce a C<sub>5</sub> diolefins stream, a BTX stream, a DCPD stream, and a fuel oil stream.

56. A process according to claim 49 wherein said hydrocarbon feed is selected from the group consisting of ethane, propane, butanes, pentanes, naphtha and mixtures thereof.

57. A process according to claim 49 wherein said hydrocarbon feed consists essentially of  $C_5$  hydrocarbons.

58. A process for producing a dilute ethylene stream and a dilute propylene stream from a cracked gas stream, said process comprising the following steps in the order named:

- 5           (1)     separating said cracked gas stream in a deethanizer zone to produce a  $C_2$  – stream and a  $C_3+$  stream;
- (2).    hydrogenating said  $C_2$ - stream in a hydrogenation zone to remove a portion of the acetylene to produce said dilute ethylene stream;
- (3)     routing said  $C_3+$  stream to storage or other process unit.

10   59. A process according to claim 58 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

60   A process according to claim 59 wherein said dilute ethylene derivative unit produces ethylbenzene.

15   61. A process for producing a dilute ethylene stream from a cracked gas stream, said process comprising the following steps in the order named:

- (1)     separating said cracked gas stream in a deethanizer zone to produce a  $C_2$  – stream and a  $C_3+$  stream;
- (2)     compressing said  $C_2$ - stream in a compression zone to form a pressurized  $C_2$ - stream;
- 20         (3)     hydrogenating said pressurized  $C_2$ - stream in a hydrogenation zone to remove a portion of the acetylene to produce said dilute ethylene stream;
- (4)     routing said  $C_3+$  stream to storage or other process unit.

62. A process according to claim 61 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

63. A process according to claim 62 wherein said dilute ethylene derivative unit produces ethylbenzene.

64. A process for producing a dilute ethylene stream from a cracked gas stream, said process comprising the following steps in the order named:

- 5           (1)     hydrogenating a portion of the acetylene in said cracked gas stream in a hydrogenation zone to produce a reduced acetylene cracked gas stream;
- (2)     separating said reduced acetylene cracked gas stream in a deethanizer zone to produce said dilute ethylene stream and a C<sub>3</sub>+ stream;
- (3)     routing said C<sub>3</sub>+ stream to storage or other process unit.

10 65. A process according to claim 64 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

66. A process according to claim 65 wherein said dilute ethylene derivative unit produces ethylbenzene.

67. A process for producing a dilute ethylene stream said process comprising the following  
15 steps in the order named:

- (1)     heating a hydrocarbon feed in a cracking zone to form a raw cracked gas stream; wherein said cracked gas stream comprises hydrogen, methane, C<sub>2</sub> hydrocarbons, C<sub>3</sub> hydrocarbons and heavier constituents;
- (2)     quenching said raw cracked gas stream in a quenching zone to produce a  
20 quenched, cracked gas stream;
- (3)     compressing said quenched, cracked gas stream in a first compression zone to form a pressurized cracked gas stream;
- (4)     deacidifying said pressurized, cracked gas stream in a deacidifying zone to remove a portion of the hydrogen sulfide to form a wet cracked gas stream;

(5) drying said wet cracked gas stream in a drying zone to produce a cracked gas stream.

(6) separating said cracked gas stream in a deethanizer zone to produce a C<sub>2</sub>- stream and a C<sub>3</sub>+ stream;

5 (7) compressing said C<sub>2</sub>- stream in a second compression zone to form a pressurized C<sub>2</sub>- stream;

(8) hydrogenating said pressurized C<sub>2</sub>- stream in a hydrogenation zone to remove a portion of the acetylene to produce said dilute ethylene stream; and

(9) routing said C<sub>3</sub>+ stream to storage or other process unit.

10 68. A process according to claim 67 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

69. A process according to claim 68 wherein said dilute ethylene derivative unit produces ethylbenzene.

70. A process for producing a dilute ethylene stream, said process comprising the following  
15 steps in the order named:

(1) heating a hydrocarbon feed in a cracking zone to form a cracked gas stream; wherein said cracked gas stream comprises hydrogen, methane, C<sub>2</sub> hydrocarbons, C<sub>3</sub> hydrocarbons, and heavier constituents;

(2) quenching said raw cracked gas stream in a quenching zone to produce a  
20 quenched, cracked gas stream;

(3) compressing said quenched, cracked gas stream in a first compression zone to form a pressurized cracked gas stream;

(4) deacidifying said pressurized, cracked gas stream in a deacidifying zone to remove a portion of the hydrogen sulfide to form a wet cracked gas stream;

(5) drying said wet cracked gas stream in a drying zone to produce a cracked gas stream;

(6) separating said cracked gas stream in a deethanizer zone to produce a C<sub>2</sub>- stream and a C<sub>3</sub>+ stream;

5 (7) hydrogenating said pressurized, C<sub>2</sub>- stream in said hydrogenation zone to remove a portion of the acetylene to produce said dilute ethylene stream; and

(8) routing said C<sub>3</sub>+ stream to storage or other process unit.

71. A process according to claim 70 further comprising passing said dilute ethylene stream to a dilute ethylene derivative unit.

10 72. A process according to claim 70 wherein said dilute ethylene derivative unit produces ethylbenzene.

73. A process for producing a dilute ethylene stream, said process comprising the following steps in the order named:

(1) heating a hydrocarbon feed in a cracking zone to form a raw cracked gas stream;  
15 wherein said raw cracked gas stream comprises hydrogen, methane, C<sub>2</sub> hydrocarbons, C<sub>3</sub> hydrocarbons, and heavier constituents;

(2) quenching said raw cracked gas stream in a quenching zone to produce a quenched, cracked gas stream;

(3) compressing said quenched, cracked gas stream in a first compression zone to  
20 form a pressurized cracked gas stream;

(4) deacidifying said pressurized, cracked gas stream in a deacidifying zone to remove a portion of the hydrogen sulfide to form a wet cracked gas stream; and

(5) drying said cracked gas stream in a drying zone to produce a cracked gas stream.

(6) hydrogenating a portion of the acetylene in said cracked gas stream in a  
25 hydrogenation zone to produce a reduced acetylene cracked gas stream;

(7) separating said reduced acetylene cracked gas stream in a deethanizer zone to produce said dilute ethylene stream and a C<sub>3</sub>+ stream;

(8) routing said C<sub>3</sub>+ stream to storage or other process unit.

74. A process according to claim 73 further comprising passing said dilute ethylene stream  
5 to a dilute ethylene derivative unit.

75. A process according to claim 73 wherein said dilute ethylene derivative unit produces ethylbenzene.